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Scientists define advanced control systems

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WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Scientists at the Air Force Research Laboratory have successfully defined the architectures and characteristics of advanced control systems that may one day control the next-generation autonomous air and space vehicle systems.

In the future, Validation and Verification of Intelligent and Adaptive Control Systems (VVIACS) will be used to verify autonomous/intelligent capabilities for air and space vehicle systems. AFRL's Air Vehicles's Directorate scientists recently came one step closer to making VVIACS a reality. They defined approximately 100 fundamental properties, as well as validation and verification challenges, for 10 emerging control systems. Some of these control systems include automatic air collision avoidance, photonic vehicle management systems, intelligent re-configurable control, and prognostic health management.

VVIACS will not create these control systems. However, it will address the issue that consumes more than half of the time and money put into control system development—performance evaluation. The control system characteristics defined in this phase of the VVIACS program will be used in this evaluation.

In order to safely share airspace with manned aircraft, unmanned air and space vehicle systems must have certain control systems. One of these control systems would give unmanned systems automatic air collision avoidance or "see and avoid" capability. Without this capability, unmanned air and space systems are currently segregated from manned airspace, limiting their operational usefulness.

Once control systems like this "see and avoid" capability are developed, they must be tested to verify they will perform as required. A system must be in place to accomplish this testing prior to flight tests in a real-world environment, where personnel and valuable assets are potentially at risk. VVIACS is being developed to accomplish this difficult task.

Now that scientists have defined the critical architectures and characteristics for these advanced control systems, they will develop methods to verify that the control software's autonomous decision making will respond correctly to real-world situations. For this step, they will use hardware-in-the-loop, real time simulation. Successful completion of this final phase of VVIACS will help to ensure the safe incorporation of unmanned air and space systems into actual operational environments. @